

Amendment

(AMENDMENT under Article 11)

To: Hon. Commissioner, Patent Office

1. Indication of the International Application

PCT/JP2004/009021

2. Applicant

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4. Subject of amendment Description

5. Contents of amendment See attached papers.

[0003] In the 'problem to be solved by the invention', the passage on page 3, line 18 which reads: "A data communication apparatus according to the present invention includes an enclosure, a loop coil antenna arranged so that at least a portion of a conductor extends along the lateral surface of the enclosure, and a

semiconductor integrated circuit connected to the loop coil antenna, the semiconductor integrated circuit having non-contact data communication over the loop coil antenna with an exterior communication device by using electromagnetic induction.” is corrected to read: “A data communication apparatus according to the present invention includes an enclosure, a mobile phone unit arranged within the enclosure, a loop coil antenna arranged so that at least a portion of a conductor extends along the lateral surface of the enclosure, and a semiconductor integrated circuit connected to the loop coil antenna, the semiconductor integrated circuit carrying out non-contact data communication over the loop coil antenna with an exterior communication device with use of electromagnetic induction, and having the function of a non-contact IC card and/or a reader/writer function.”

6. List of Attached Papers

pages 3, 4 and 4/1 of the specification

major surfaces of the loop coil antenna 101, the planar loop coil antenna 101 must be arranged centrally in the enclosure 100. However, if, with the portable device, such as the aforementioned cellular phone, this planar loop coil antenna is arranged centrally in the enclosure, there is imposed significant mounting constraint.

Moreover, if, with the above-described loop coil antenna 101, the number of turns of the conductor is increased, the opening area of the loop coil antenna is decreased, thus narrowing down the area of sensitivity of communication with the reader/writer.

Disclosure of the Invention

It is an object of the present invention to provide a data communication apparatus whereby it is possible to resolve the aforementioned problems inherent in the prior art.

It is another object of the present invention to provide a non-contact data communication apparatus in which the sensitivity of the loop coil antenna is equalized on both major surfaces of the enclosure, regardless of the thickness of the enclosure, and in which it is possible to enlarge the sensitivity area.

A data communication apparatus according to the present invention includes an enclosure, a mobile phone unit arranged within the enclosure, a loop coil antenna arranged so that at least a portion of a conductor extends along the lateral surface of the enclosure, and a semiconductor integrated circuit connected to the

loop coil antenna, the semiconductor integrated circuit carrying out non-contact data communication over the loop coil antenna with an exterior communication device with use of electromagnetic induction, and having the function of a non-contact IC card and/or a reader/writer function.

Effect of the Invention

With the data communication apparatus, described above, in which the loop coil antenna is arranged with its conductor extending along the lateral side of the enclosure, the sensitivity of the loop coil antenna may be equalized in a direction along the thickness of the enclosure, thereby enlarging the area of communication sensitivity of the loop coil antenna.

Other objects and specified advantages of the present invention will become more apparent from the following explanation especially when read in conjunction with the drawings.

Brief Description of the Drawings

Fig.1 is a schematic perspective view showing the structure of a cellular phone embodying the present invention.

Fig.2 is a block diagram showing the structure of a semiconductor integrated circuit built into the cellular phone.

Fig.3 is a perspective view showing the structure of a loop coil antenna

arranged in the cellular phone.

Fig.4 is a plan view showing the structure of the loop coil antenna and a

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(1) [0003] In the 'problem to be solved by the invention', the passage on page 3, line 18 which reads: "A data communication apparatus according to the present invention includes an enclosure, a mobile phone unit arranged within the enclosure,

a loop coil antenna arranged so that at least a portion of a conductor extends along the lateral surface of the enclosure, and a semiconductor integrated circuit connected to the loop coil antenna, the semiconductor integrated circuit carrying out non-contact data communication over the loop coil antenna with an exterior communication device with use of electromagnetic induction, and having the function of a non-contact IC card and/or a reader/writer function.”, is corrected to read: “A data communication apparatus according to the present invention includes an enclosure, a mobile phone function unit arranged within said enclosure, a loop coil antenna arranged so that at least a portion of a conductor extends along lateral surfaces, which are surfaces forming said enclosure with the exclusion of both major surfaces of the enclosure, and a semiconductor integrated circuit connected to said loop coil antenna, said semiconductor integrated circuit carrying out non-contact data communication over said loop coil antenna with an exterior communication device with use of electromagnetic induction, and having the function of a non-contact IC card and/or a reader/writer function.”

(2) In the Claims, page 11, claim 1, the passage reading: “a loop coil antenna arranged so that at least a portion of a conductor extends along the lateral surface of the enclosure” is corrected to read: “a loop coil antenna arranged so that at least a portion of a conductor extends along lateral surfaces, which are surfaces forming said enclosure with the exclusion of both major surfaces of the enclosure”.

6. List of Attached Papers

pages 3, 4 and 4/1 of the specification, and claims page 11, 11/1

major surfaces of the loop coil antenna 101, the planar loop coil antenna 101 must be arranged centrally in the enclosure 100. However, if, with the portable device, such as the aforementioned cellular phone, this planar loop coil antenna is arranged centrally in the enclosure, there is imposed significant mounting constraint.

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A data communication apparatus according to the present invention includes an enclosure, a mobile phone function unit arranged within said enclosure, a loop coil antenna arranged so that at least a portion of a conductor extends along lateral surfaces, which are surfaces forming said enclosure with the exclusion of both

major surfaces of the enclosure, and a semiconductor integrated circuit connected to said loop coil antenna, said semiconductor integrated circuit carrying out non-contact data communication over said loop coil antenna with an exterior communication device with use of electromagnetic induction, and having the function of a non-contact IC card and/or a reader/writer function.

Effect of the Invention

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CLAIMS

1. (Amended) A data communication apparatus comprising
an enclosure;
a mobile phone function unit arranged in said casing;
a loop coil antenna arranged so that at least a portion of a conductor extends along lateral surfaces, which are surfaces forming said enclosure with the exclusion of both major surfaces of the enclosure; and
a semiconductor integrated circuit connected to said loop coil antenna, said semiconductor integrated circuit having a non-contact IC card function and/or a reader/writer function and carrying out non-contact data communication over said loop coil antenna with an exterior communication device with use of electromagnetic induction.
2. The data communication apparatus according to claim 1 wherein said conductor is arranged for extending along the entire periphery of said enclosure.
3. The data communication apparatus according to claim 1 wherein said loop coil antenna is of a three-dimensional shape, with said conductor being mounted for extending spirally along the lateral surfaces of said enclosure.
4. The data communication apparatus according to claim 3 wherein said loop coil antenna is formed by forming a plurality of patterned linear copper foils on a major surface of a flexible insulating substrate along a direction perpendicular to the longitudinal direction of said insulating substrate.

5. The data communication apparatus according to claim 1 wherein said loop coil antenna is formed by being embedded in a lateral surface of said enclosure.
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